



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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REPLY TO
ATTN OF: AA-SVO-3/71-4-6

APR 29 1971

MEMORANDUM

TO: Distribution

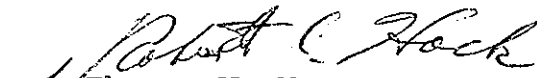
FROM: AA/Manager, Apollo-Skylab Programs

SUBJECT: Skylab Operations Directive, SLPD #43A

Copies of the subject directive are attached for your information. The requirements for KSC implementation of this Directive will be described in the "KSC Operations Plan for Skylab, KPD 8610.X (TBD)", the first draft of which will be provided for your review in the very near future.

The major mission constraints (Section 1.4.1) that impact the launch parameters; e.g., launch intervals, launch windows, scrub turnarounds, etc., will be included in more detail in the next Preliminary Reference Trajectory to be published by MSC on August 7, 1971. These constraints are reviewed by the KSC representatives to the MSC Flight Operations Plan (FOP) monthly meeting and should adequately include items critical to KSC.

If you have any questions concerning the Skylab Operations Directive or the subsidiary documents, please contact Mr. Tom Davis of my Skylab Space Vehicle Office, AA-SVO-3, extension 7-3281.


Thomas W. Morgan
Brigadier General, USAF

Enclosure: Skylab Operations Directive, SLPD #43A

Distribution:
Apollo-Skylab Distribution M

BRIEFING NOTE

TO: Dr. Debus

APR 29 1971

SUBJECT: Skylab Operations Directive, SLPD #43A

The subject directive is being provided to the Directorates for information only since we are in the process of developing a "KSC Operations Plan for Skylab" which will implement those requirements that affect KSC.

The requirements of our Operations Plan should not cause any major impact to the Directorates since they document things that have been done in the Apollo Program which are applicable to Skylab or delineate modifications to Apollo requirements to make them applicable to Skylab.

Bob. Lock
Thomas W. Morgan
Brigadier General, USAF

OFFICE OF
MANNED SPACE FLIGHT

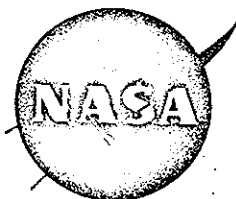
SKYLAB PROGRAM

MARCH 26, 1971

SKYLAB

PROGRAM DIRECTIVE NO. 43A

OPERATIONS DIRECTIVE



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MAR 26 1971

SKYLAB

PROGRAM DIRECTIVE NO. 43A

TO: Distribution

FROM:


DIRECTOR, SKYLAB PROGRAM

SUBJECT: Operations Directive for the Skylab Program

This document is the Skylab Operations Directive; it supersedes Program Directive No. 43, dated April 10, 1970. The requirements set forth herein shall be reflected in subsidiary documents for missions and operations, and shall be fully implemented by cognizant elements of the Skylab Program.

SUMMARY OF CHANGES
PROGRAM DIRECTIVE NO. 43A

Format Change

This revision of the Operations Directive introduces a new format. Major divisions of the new format correspond roughly to those of the old in the following way:

New Format (PD 43A)

Section 1.0
Section 2.0
Section 3.0
Section 4.0
Appendix A

Old Format (PD 43)

Basic Plan
Appendix A
Appendix B
Appendix C (TBS)
Sections and Tables from
the above Appendices

Textual Changes

Those portions of Sections 1.0, 2.0, and 3.0 that have been added or significantly affected by this revision are marked by vertical lines in the outer margins of the pages. Section 4.0 and Appendix A are entirely new and therefore are not marked.

Those sections and paragraphs of Program Directive No. 43, dated April 10, 1970, whose substance has been deleted by this revision are as follows:

Basic Plan

4.0 (1)
5.2
5.3
5.4
5.8
5.9
5.10
5.11

Appendix A

1.0
2.2 (1) (d)
3.3.2 (1)
3.4

Appendix B

1.0
2.2 (1) (d)
3.3.2 (1)
3.4

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NOMENCLATURE

AM	Airlock Module
ATM	Apollo Telescope Mount
CCB	Configuration Control Board
CSM	Command Service Module
DOD	Department of Defense
ERD	Experiment Requirements Document
EREP	Earth Resources Experiments Package
EVA	Extra-Vehicular Activities
FMAD	Flight Missions Assignment Document
FSP	Flight Scheduling Precedence
KSC	Kennedy Space Center
LC	Launch Complex
LV	Launch Vehicle
MDA	Multiple Docking Adapter
ML	Skylab Program Office, OMSF
MLO	Directorate of Operations, Skylab Program Office (OMSF)
MMRD	Mission Medical Requirements Document
MRD	Mission Requirements Document
MSC	Manned Spacecraft Center
MSFC	Marshall Space Flight Center
MSFN	Manned Space Flight Network
N/A	Not applicable
NM	Nautical miles
OMSF	Office of Manned Space Flight
OWS	Orbital Workshop
PAD	Project Approval Document
S-IC	First stage of the SL-1 launch vehicle
S-II	Second stage of the SL-1 launch vehicle
SL-1	The unmanned Saturn Workshop launch, or the associated space vehicle
SL-2	The first manned Skylab launch, or the associated space vehicle
SL-1/SL-2	The first Skylab mission, comprising space vehicles (and launches) SL-1 and SL-2
SL-3	The first revisit mission, or the associated manned space vehicle, or the associated launch
SL-4	The second revisit mission, or the associated manned space vehicle, or the associated launch
SWS	Saturn Workshop
TBD	To be defined
TBS	To be supplied
~	Approximately
>	Greater than

DEFINITIONS

- experiment - - - - - Experiments are planned investigations which are conducted in flight during manned space missions, or which are essentially connected with the in-flight situation. These investigations, which are approved by the Manned Space Flight Experiments Board and assigned by the Headquarters Program Office (ML), are conducted to obtain research information which can contribute to the advancement of science and technology.
- flight scheduling precedence - - - A number assigned to each of the individual experiments as an aid in scheduling these experiments in the mission flight plans.
- group-related experiments - - - - Experiments that require significant in-flight crew support and which are closely related to each other either through common study of the flight crew or by integration into a single subsystem. Specifically, these are the medical, solar astronomy (ATM), and earth-resources experiments.
- hold - - - - - A planned or anticipated delay in the terminal launch countdown which does not require rescheduling to a later launch window.
- individual experiments - - - - - The experiments other than group-related and passive experiments that require significant in-flight crew support and which are not as closely related to each other as are the group-related experiments.
- in-flight system tests - - - - - Tests which are conducted to evaluate the performance of a particular system or subsystem to determine its suitability on future Skylab missions.

in-flight operational tests - - - Tests involving operational techniques or procedures which are conducted to determine the method of operating systems or subsystems to obtain optimum results.

malfunction - - - - - A failure; the inability of a system, subsystem, component, or part to perform its required function during test, operation, or end use (reference 6).

orbital assembly - - - - - The Saturn Workshop plus a docked CSM.

passive experiments - - - - - Experiments whose associated in-flight crew support requirements are either insignificant or non-existent.

pre- and post-flight experiments - Experiments having no in-flight requirements.

Saturn Workshop - - - - - The space assembly which comprises the Orbital Workshop, Airlock Module, Multiple Docking Adapter, and the Apollo Telescope Mount.

scrub - - - - - An interruption of the terminal launch countdown which requires rescheduling to a later launch window.

single failure point - - - - - A single item of hardware which, if it failed, would lead directly to loss of a part, component, system, mission, or crew member (reference 6).

unattended operations - - - - - Operations performed onboard a manned spacecraft without active participation by the crew.

unmanned operations - - - - - Saturn Workshop operations performed automatically by onboard systems or in response to ground commands during periods between manned flights or subsequent to the last manned flight.

1.0 SKYLAB PROGRAM

1.0 SKYLAB PROGRAM

1.1 INTRODUCTION

The Skylab Program exists to establish an experimental space laboratory in orbit around the earth; there the laboratory will function throughout three long-duration, manned missions and two intervening periods of unmanned flight. A different three-man crew will inhabit and operate the orbital assembly on each of the three missions. Each crew will evaluate the orbital assembly as a habitable workshop and will perform a number of medical, scientific, and technological experiments. Certain experiments and tests may be performed under ground control during the unmanned periods. Table 1.1 contains a summary of Skylab mission data; Table 1.2 reflects the current assignment of approved experiments.

1.2 OPERATIONS DIRECTIVE

1.2.1 Background

The Operations Directive supersedes and replaces the operations portions of the former AAP Flight Mission Directives (AAP Directives Nos. 3D, 5A, and 14A). This revision, Program Directive No. 43A, supersedes Program Directive No. 43, dated 10 April 1970.

1.2.2 Purpose and Scope

The Operations Directive is the means by which the Skylab Program Director communicates mission objectives and programmatic mission requirements to the implementing offices and Centers. It comprises four major sections and an appendix. The first section is a basic plan that identifies program-wide objectives and requirements, lists key operational documents, and calls out responsibilities pertaining to the key documents. Each of the remaining sections states objectives and requirements for one of the Skylab missions. The appendix contains detailed instructions for planning and performing the Skylab experiments.

1.2.3 Authority

The Skylab Operations Directive is written under the authority granted the Program Director through the Skylab Project Approval Document (reference 1) and the Flight Mission Assignments Document (reference 2).

1.2.4 Applicability

This directive applies to the Office of Manned Space Flight (OMSF) and to the Manned Space Flight installations.

MISSION	SL-1/SL-2		SL-3	SL-4
OBJECTIVES	Establish the Skylab orbital assembly in earth orbit		Perform unmanned SWS operations	Perform unmanned SWS operations
	Obtain medical data		Reactivate the orbital assembly	Reactivate the orbital assembly
	Perform in-flight experiments		Obtain medical data	Obtain medical data
SPACE VEHICLE/LAUNCH	SL-1	SL-2	SL-3	SL-4
LAUNCH VEHICLE	SATURN V (S-IC and SII) 513	SATURN IB 206	SATURN IB 207	SATURN IB 208
KSC LAUNCH COMPLEX	39A	39B	39B	39B
PAYLOAD	SATURN WORKSHOP OWS AM MDA ATM Experiments	CSM 116 3-man crew Experiments	CSM 117 3-man crew Experiments	CSM 118 3-man crew Experiments
ORBITAL INCLINATION	50 Degrees	50 Degrees	50 Degrees	50 Degrees
ORBITAL ALTITUDE	~ 235 NM	~ 235 NM	> 210 NM	> 210 NM
LAUNCH INTERVAL (FROM SL-1 LAUNCH)	-	1 day	~ 91 days	~ 181 days
MANNED FLIGHT DURATION	-	Up to 28 days	Up to 56 days	Up to 56 days

Table 1.1 Skylab Baseline Mission Data

PRE- AND POST-FLIGHT EXPERIMENTS

<u>Experiment</u>	<u>Mission Assignment</u>		
	<u>SL-1/SL-2</u>	<u>SL-3</u>	<u>SL-4</u>
M078 - Bone Mineral Measurement (B)	A	A	A
M111 - Cytogenetic Studies of Blood	A	A	A
M112 - Man's Immunity - In vitro aspects	A	A	A
M113 - Blood Volume and Red Cell Life Span	A	A	A
M114 - Red Blood Cell Metabolism	A	A	A
M115 - Special Hematologic Effects	A	A	A

IN-FLIGHT EXPERIMENTS

<u>Experiment</u>	<u>Mission Assignment</u>		
	<u>SL-1/SL-2</u>	<u>SL-3</u>	<u>SL-4</u>
<u>Passive</u>			
M415 - Thermal Control Coatings	A		
S071 - Circadian Rhythm - Pocket Mice		A	
S072 - Circadian Rhythm - Vinegar Gnat		A	
S150 - Galactic X-ray Mapping (B)			A
T018 - Precision Optical Tracking	A	A	A
<u>Medical</u>			
M071 - Mineral Balance	A	A	A
M073 - Bioassay of Body Fluids	A	A	A
M074 - Specimen Mass Measurement	A	A	A
M092 - In-Flight Lower Body Negative Pressure	A	A	A
M093 - Vectorcardiogram	A	A	A
M131 - Human Vestibular Function	A	A	
M133 - Sleep Monitoring	A	A	
M151 - Time and Motion Study	A	A	A
M171 - Metabolic Activity	A	A	A
M172 - Body Mass Measurement	A	A	A

LEGEND: A - The experiment, or a part of the experiment, is assigned to this mission (refer to the detailed instructions contained in Appendix A, Table A-1).

C - The experiment, or a part of the experiment, is a candidate for performance on this mission, provided the requirements set forth in Table A-1 will not have been satisfied on an earlier mission (or missions).

Table 1.2 Skylab Experiments

IN-FLIGHT EXPERIMENTS

<u>Experiment</u>	<u>Mission Assignment</u>		
	<u>SL-1/SL-2</u>	<u>SL-3</u>	<u>SL-4</u>
<u>ATM</u>			
S052 - White Light Coronagraph	A	A	A
S054 - X-ray Spectrographic Telescope	A	A	A
S055 - UV Spectrometer (A)	A	A	A
S056 - Dual X-ray Telescope	A	A	A
S082 - UV Spectrograph/Heliograph	A	A	A
<u>EREP</u>			
S190 - Multispectral Photographic Facility	A	A	A
S191 - Infrared Spectrometer	A	A	A
S192 - Multispectral Scanner	A	A	A
S193 - Microwave Radiometer/Scatterometer and Altimeter	A	A	A
S194 - L-Band Radiometer	A	A	A
<u>INDIVIDUAL</u>			
D008 - Radiation in Spacecraft	A		
D021 - Expandable Airlock Technology (B)	A	C	C
D024 - Thermal Control Coatings	A	C	C
M479 - Zero Gravity Flammability (B)	C	C	C
M487 - Habitability/Crew Quarters	A	A	A
M509 - Astronaut Maneuvering Equipment	A	C	C
M512 - Materials Processing in Space	A	C	
S009 - Nuclear Emulsion	A		
S015 - Zero Gravity Single Human Cells	A		
S019 - UV Stellar Astronomy	A	C	C
S020 - X-ray/UV Solar Photography	C	C	C
S063 - UV Airglow Horizon Photography	C	C	C
S073 - Gegenschein/Zodiacal Light	A	A	A
S149 - Particle Collection	C	A	A
S183 - UV Panorama	A	C	C
T002 - Manual Navigation Sightings (B)	C	C	C
T003 - In-flight Aerosol Analysis	A	A	A
T013 - Crew Vehicle Disturbance	C	C	C
T020 - Foot-Controlled Maneuver Unit	C	C	C
T025 - Coronagraph Contamination Measurement	A		
T027 - ATM Contamination Measurement	A	A	A

Table 1.2 Skylab Experiments (Cont'd.)

1.2.5 Publication and Revisions

The Director for Skylab Operations (OMSF, Code MLO) has the responsibility within the Skylab Program Office for preparing, coordinating, and maintaining this document. It will be revised as necessary by Level 1 CCB action in accordance with reference 5; requests for changes or additions should be directed to the Skylab Program Director, (OMSF, Code ML).

1.3 PROGRAM PURPOSE AND OBJECTIVES

1.3.1 Program Purpose

The Skylab Program has been established for three explicit purposes: first, and most important, to determine man's ability to live and work in space for extended periods; second, to extend the science of solar astronomy beyond the limits of earth-based observations; and third, to increase man's knowledge in a variety of other scientific and technological regimes.

1.3.2 Program Objectives

The following objectives have been formulated to support the program purpose. They are quoted from the Skylab Project Approval Document (reference 1).

- (1) Biomedical and Behavioral Performance - determine and evaluate man's physiological responses and aptitudes in space under zero gravity conditions, and his post-mission adaptation to the terrestrial environment, through a series of progressively longer missions, and to determine the increments by which mission duration can be increased.
- (2) Man-machine Relationships - to develop and evaluate efficient techniques utilizing man for sensor operation, discrimination, data selection and evaluation, manual control, maintenance and repair, assembly and set-up and mobility involved in various operations.
- (3) Long Duration Systems Operation - to develop techniques for increasing systems life, for long duration habitability and for long duration mission control. To investigate and develop techniques for in-flight test and qualification of advanced subsystems.
- (4) Experiments - to conduct solar astronomy and other science, technology and applications experiments in which man's contributions will improve the quality and/or yield of the results.

1.3.3 Mission Objectives

The program objectives serve to guide the overall program development; they must be stated in a more specific form, however, for application to the individual missions. The resulting mission objectives are set forth in Sections 2.2, 3.2, and 4.2 for Missions SL-1/SL-2, SL-3, and SL-4, respectively.

1.4 GENERAL PROGRAM REQUIREMENTS

The requirements set forth in this section apply to the Skylab Program as a whole. Requirements that pertain only to specific missions will be stated in the appropriate mission sections.

1.4.1 Mission Constraints

The following constraints apply to all Skylab missions. The implementing centers may further constrain the missions, provided the added constraints are in accord with references 1, 2, and 3.

- (1) The manned Skylab space vehicles shall be launched at intervals of approximately 90 days.
- (2) The Skylab orbital inclination shall be 50° .
- (3) The Saturn Workshop shall be placed in an orbit sufficiently high to insure a minimum altitude of 210 nautical miles eight months after launch.
- (4) Docking of the mission CSM to the Saturn Workshop shall be confined to the axial docking port of the Multiple Docking Adapter (MDA).

1.4.2 In-flight Experiments

- (1) Guidelines for the assignment and mission planning of in-flight experiments are given in Appendix A, and in Sections 2.3, 3.3, and 4.3 for Missions SL-1/SL-2, SL-3, and SL-4, respectively.
- (2) The earth resources experiments shall be scheduled for a total of 45 passes over the chosen ground sites.

1.4.3 Space Rescue

A space rescue capability shall be provided for each mission, using the next available in-line Saturn IB/CSM space vehicle and a two-man rescue flight crew. (Detailed operational requirements are TBS; they will be developed in Sections 2.0, 3.0, and 4.0 for Missions SL-1/SL-2, SL-3, and SL-4, respectively).

1.4.4 Educational Activities

A program of in-flight educational activities shall be developed for each mission. Crew time and other resources shall be allocated to these activities in accordance with the Education Plan (TBD -- refer to Section 1.5.6) and the detailed requirements to be supplied in Sections 2.0, 3.0, and 4.0.

1.5 DOCUMENTATION

This section has a two-fold purpose: to identify the primary documents required for Skylab mission planning and operations, and to clarify certain relationships among these documents and the Operations Directive. Figure 1 depicts these documents and their inter-relationships. The purpose and scope of the Operations Directive, and the correspondence which it bears to the higher documents, are discussed in Sections 1.2.2 and 1.2.3. The other documents are treated in the subsections which follow.

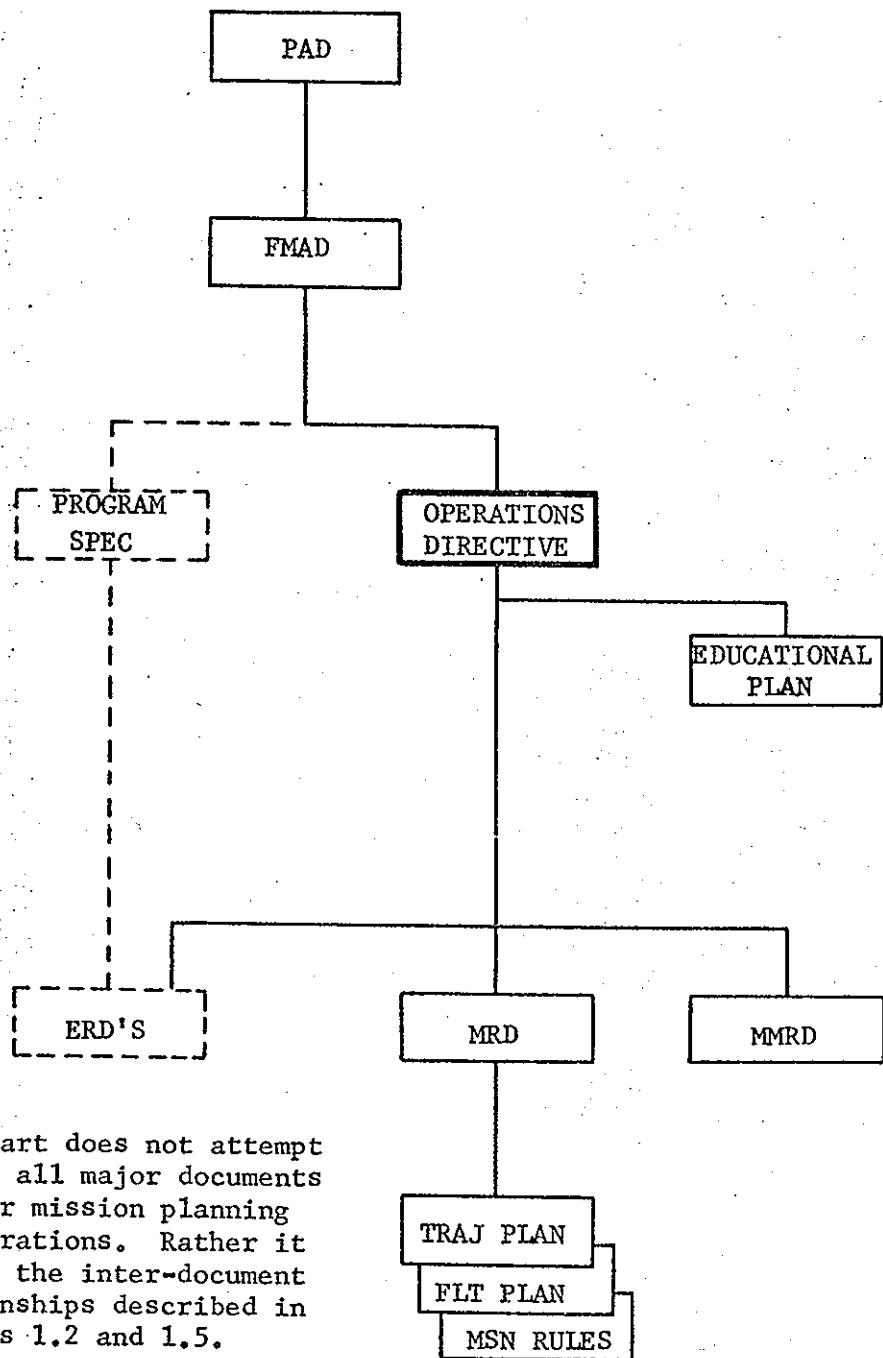
To assist in the orderly development of Skylab operational documents, MSC shall prepare a schedule showing the need dates of issue for the documents listed in Sections 1.5.1 through 1.5.6, including major revisions and iterations. The schedule of documents shall be coordinated with MSFC and KSC, and shall be posted and maintained in the Skylab program control rooms not later than 24 months before the planned SL-1 launch.

1.5.1 Mission Requirements Document (MRD)

The MRD shall set forth the detailed operational requirements for each of the Skylab missions. It shall contain, and amplify as necessary, all objectives, requirements, guidelines, and instructions contained in the Operations Directive. To make the relationship of the MRD to the OD clear at all times, each issue of the MRD shall include flag sheets to identify all areas in which the MRD is not consistent with the OD. The MRD shall be jointly prepared and approved by MSC and MSFC, and shall be coordinated under the cognizance of the Mission Requirements Panel, as established in reference 4.

1.5.2 Mission Medical Requirements Document (MMRD)

The MMRD will provide for a medical baseline plan for the provision and integration of all medical activities (preflight, in-flight, and post-flight) associated with the Skylab Program. It will define the medical operations philosophy, responsibilities, and manning for the individual missions, and for the total Skylab Program as well. The MMRD will provide for planned methods of interacting the in-flight data from the medical experiments with the medical operations data; it will also provide for those methods to be utilized for the purpose of decision on the qualification of man for the next longer increment of weightless flight. The MMRD shall be prepared by MSC.



NOTE: This chart does not attempt to show all major documents used for mission planning and operations. Rather it depicts the inter-document relationships described in Sections 1.2 and 1.5.

Figure 1. Skylab Mission Documentation

1.5.3 Trajectory Plan

Trajectory data for the ascent and orbital phases of each mission shall be developed in the Trajectory Plan from the requirements set forth in the MRD. MSFC shall be responsible for the ascent trajectory, and MSC for the orbital trajectory.

1.5.4 Flight Plan

The Flight Plan shall identify and schedule all in-flight crew activities required to accomplish the mission objectives and to meet the requirements set forth in the MRD. MSC shall prepare the Flight Plan.

1.5.5 Mission Rules

The Mission Rules shall be developed in accordance with the MRD and the Mission Rules Guidelines to be developed in OMSF (ML). Their purpose is to ensure crew safety and to maximize the probability of mission success by guiding operational decisions in the launch and flight phases of the mission. Both Launch Mission Rules and Flight Mission Rules shall be prepared.

1.5.5.1 Launch Mission Rules

KSC shall prepare the Launch Mission Rules; MSC and MSFC will concur in the final Rules.

1.5.5.2 Flight Mission Rules

MSC shall prepare the Flight Mission Rules; MSFC will concur in the final Rules.

1.5.6 Educational Plan

The Educational Plan is TBS.

1.5.7 Experiments Requirements Document (ERD)

All Skylab ERD's are established and written under the Skylab Program Specification (reference 3). Thus the formal objectives of each experiment are stated in and controlled through the Program Specification. However, the assignment of experiments to particular missions, and the extent to which each experiment shall be performed on each mission, are controlled by the Program Director through the Operations Directive. All ERD's, therefore, shall be consistent with the planning guidelines and assignment instructions set forth in the Operations Directive.

2.0 SKYLAB MISSION SL-1/SL-2

2.0 SKYLAB MISSION SL-1/SL-2

2.1 MISSION DESCRIPTION

Skylab Mission SL-1/SL-2 will comprise two launches: the first, SL-1, will place the unmanned Saturn Workshop in near-earth orbit, and the second, SL-2, will launch the CSM and its three-man crew. Once in orbit, the CSM will rendezvous with, and dock to, the SWS. The crew will then enter the SWS, activate its systems, and proceed to inhabit and operate the combined SWS and CSM (orbital assembly) for up to 28 days. During this time the crew will perform systems and operational tests and the assigned experiments. To conclude the mission, the crew will configure the SWS for unmanned operations, undock the CSM, and return to earth in the Command Module.

2.2 MISSION OBJECTIVES

- (1) Establish the Skylab orbital assembly in earth orbit.
 - (a) Operate the orbital assembly (SWS plus CSM) as a habitable space structure for up to 28 days after the SL-2 launch.
 - (b) Obtain data for evaluating the performance of the orbital assembly.
 - (c) Obtain data for evaluating crew mobility and work capability in both intravehicular and extravehicular activity.
- (2) Obtain medical data on the crew for use in extending the duration of manned space flights.
 - (a) Obtain medical data for determining the effects on the crew which result from a space flight of up to 28 days duration.
 - (b) Obtain medical data for determining if a subsequent Skylab mission of up to 56 days duration is feasible and advisable.
- (3) Perform in-flight experiments.
 - (a) Obtain ATM solar astronomy data for continuing and extending solar studies beyond the limits of earth-based observations.
 - (b) Obtain earth resources data for continuing and extending multisensor observation of the earth from low earth orbit.
 - (c) Perform the assigned scientific, engineering, technology and DOD experiments.

NOTE FOR DEVELOPMENT EMPHASIS

For hardware development, the above objectives, together with the amplifying remarks, are to be treated as criticality category 2. Individual ATM, Earth Resources, and Medical Experiments shall be considered category 3. Scientific, Engineering, Technology, and DOD Experiments shall be category 3 or 4, as specified by the development centers. Individual critical elements within an experiment may be category 1 or 2 as appropriate. (See reference 7).

2.3 MISSION GUIDELINES

The guidelines called out in this section pertain specifically to the SL-1/SL-2 mission.

2.3.1 Mission Development Guidelines

- (1) The unmanned SL-1 space vehicle shall be launched on the date specified in the Skylab Program Level I Schedules (reference 8).
- (2) Launch of the manned SL-2 space vehicle shall be planned for the day following the launch of SL-1. Launch strategy and hardware capability shall provide a high degree of confidence that SL-2 can be launched within seven days following a successful SL-1 launch.
- (3) The SL-1/SL-2 mission shall be planned for a duration of 28 days, measured from the launch of the SL-2 space vehicle.

2.3.2 In-flight Operations Guidelines

- (1) The Orbital Workshop shall be activated and the Waste Management System made available for crew use within 24 hours of the SL-2 launch.
- (2) Samples of all urine voided after SL-2 lift-off shall be processed in the Waste Management System as soon as it becomes available for use.

2.3.3 Launch Commit Guidelines

The Launch Mission Rules shall follow these guidelines in providing pre-determined commit/non-commit decisions on as many potential failures as possible:

- (1) The SL-1 terminal launch countdown shall be scrubbed or held to repair any malfunction that can result in failure of the SWS to achieve a fully deployed and stabilized attitude and to remain habitable throughout the planned SL-1/SL-2, SL-3, and SL-4 mission sequence.

- (2) The terminal launch countdown of either the SL-1 or SL-2 space vehicle shall be scrubbed or held to repair any malfunction that can limit the SL-2 manned flight to less than 28 days duration.
- (3) The terminal launch countdown of either the SL-1 or SL-2 space vehicle shall be scrubbed or held to repair any malfunction resulting in a single failure point, an in-flight failure of which could:
 - (a) Compromise crew safety, or
 - (b) Require early termination of the SL-1/SL-2 mission, or
 - (c) Require cancellation or early termination of subsequent missions.
- (4) The terminal launch countdown of either space vehicle shall not be automatically scrubbed or held to repair the loss of an individual experiment unless the malfunction invokes one or more of the guidelines stated in (1) through (3) above. The Program Director or his authorized representative will determine the appropriate response during launch operations.

2.3.4 Guidelines for Experiments and Systems/Operational Tests

This section sets forth guidelines to govern the planning and execution of experiments, systems tests, and operational tests.

2.3.4.1 Experiments Assignment

Experiment assignments for Mission SL-1/SL-2 are given in Appendix A, Table A-1.

2.3.4.2 In-flight Systems/Operational Tests Assignment (TBD)

2.3.4.3 Pre-mission Planning Guidelines

The following guidelines, and those in the subsections below, shall be used in preparing the SL-1/SL-2 mission plans:

- (1) Approximately one of every seven mission-days shall be scheduled as an off-duty day. Each off-duty day shall include performance of experiments M071 and M073, crew rest and recreation, nominal monitoring, crew planning, and ATM solar flare activity as required.
- (2) Scheduling of crew activities shall permit rapid crew response to solar flares that may occur when the ATM console is not manned.

2.3.4.3.1 Group-related Experiments

The group-related experiments comprise the ATM, EREP, and in-flight medical experiments. Those which are assigned to Mission SL-1/SL-2 in Appendix A, Table A-1, shall be scheduled in accordance with the following guidelines:

- (1) The in-flight medical experiments shall be scheduled according to TBD guidelines.
- (2) Crew-attended ATM operations shall be scheduled for the equivalent of ten mission-hours per day, except on off-duty and EVA days.
- (3) Unattended ATM operations shall be scheduled in accordance with TBD guidelines.
- (4) The ATM experiments, excluding S055, shall each utilize not more than one magazine of film.
- (5) The EREP group of experiments shall be scheduled for at least nine passes in the Z-local vertical attitude.

2.3.4.3.2 Individual Experiments

The individual experiments (see "Definitions" and Appendix A) shall be scheduled on Mission SL-1/SL-2 in accordance with the following guidelines and the assignment instructions set forth in Appendix A:

- (1) The individual experiments assigned in whole or in part to Mission SL-1/SL-2 shall be scheduled into those intervals of the crew timeline which have not been allotted for the group-related experiments, the necessary life-support activities (eat, sleep, off-duty, personal hygiene, systems housekeeping), and the educational activities TBD.
- (2) Those intervals of the timeline that remain unfilled after paragraph (1) has been satisfied shall be used for scheduling the experiments whose assignment to Mission SL-1/SL-2 is optional. This procedure shall be optimized with respect to experiment constraints, the flight scheduling precedence (given in Appendix A for each individual experiment), spacecraft stowage capacity, crew training requirements, and other mission parameters.

2.3.4.4 Real Time Planning Guidelines

The guidelines set forth in this section shall apply while the mission is in progress; detailed guidelines are TBS.

2.3.5 Unmanned Operations Guidelines

The unmanned period that follows separation of the SL-2 CSM from the SWS will be part of Mission SL-3. Guidelines which apply to this period appear in Section 3.3.5.

3.0 SKYLAB MISSION SL-3

3.0 SKYLAB MISSION SL-3

3.1 MISSION DESCRIPTION

Skylab Mission SL-3 will begin when the SL-2 CSM and crew separate from the SWS just prior to reentry. The unmanned portion of the mission will continue until the SL-3 CSM and crew are launched to rendezvous and dock with the SWS. After docking, the SL-3 crew will enter the SWS, reactivate its systems, and proceed to inhabit and operate the orbital assembly for up to 56 days. During this time the crew will perform systems and operational tests and the assigned experiments. To conclude the mission, the crew will configure the SWS for unmanned operations, undock the CSM, and return to earth in the Command Module.

3.2 MISSION OBJECTIVES

- (1) Perform unmanned Saturn Workshop operations.
 - (a) Obtain data for evaluating the performance of the unmanned SWS.
 - (b) Obtain solar astronomy data by unmanned ATM observations.
- (2) Reactivate the Skylab orbital assembly in earth orbit.
 - (a) Operate the orbital assembly (SWS plus CSM) as a habitable space structure for up to 56 days after the SL-3 launch.
 - (b) Obtain data for evaluating the performance of the orbital assembly.
 - (c) Obtain data for evaluating crew mobility and work capability in both intravehicular and extravehicular activity.
- (3) Obtain medical data on the crew for use in extending the duration of manned space flights.
 - (a) Obtain medical data for determining the effects on the crew which result from a space flight of up to 56 days duration.
 - (b) Obtain medical data for determining if a subsequent Skylab mission of greater than 56 days duration is feasible and advisable.
- (4) Perform in-flight experiments.
 - (a) Obtain ATM solar astronomy data for continuing and extending solar studies beyond the limits of earth-based observations.

- (b) Obtain earth resources data for continuing and extending multisensor observation of the earth from the low earth orbit.
- (c) Perform the assigned scientific, engineering, technology and DOD experiments.

NOTE FOR DEVELOPMENT EMPHASIS

For hardware development, the above objectives, together with the amplifying remarks, are to be treated as criticality category 2; individual ATM, Earth Resources, and Medical Experiments shall be considered category 3. Scientific, Engineering, Technology, and DOD experiments shall be category 3 or 4, as specified by the development centers. Individual critical elements within an experiment may be category 1 or 2 as appropriate. (See reference 7).

3.3 MISSION GUIDELINES

The guidelines called out in this section pertain specifically to the SL-3 mission.

3.3.1 Mission Development Guidelines

- (1) The SL-3 space vehicle shall be launched approximately 90 days after the launch of SL-2.
- (2) The SL-3 mission shall be planned for a duration of 56 days, measured from the launch of the SL-3 space vehicle.

3.3.2 In-flight Operations Guidelines

- (1) The Orbital Workshop shall be re-activated and the Waste Management System made available for crew use within 24 hours of the SL-3 launch.
- (2) Samples of all urine voided after SL-3 lift-off shall be processed in the Waste Management System as soon as it becomes available for use.

3.3.3 Launch Commit Guidelines

The Launch Mission Rules shall follow these guidelines in providing pre-determined commit/non-commit decisions on as many potential failures as possible:

- (1) The terminal launch countdown shall be scrubbed or held to repair any malfunction that can limit the SL-3 mission to less than 56 days duration.

- (2) The terminal launch countdown shall be scrubbed or held to repair any malfunction resulting in a single failure point, and in-flight failure of which could:
 - (a) Compromise crew safety, or
 - (b) Require early termination of the mission, or
 - (c) Require cancellation or early termination of the subsequent mission.
- (3) The terminal launch countdown shall not be automatically scrubbed or held to repair the loss of an individual experiment, unless the malfunction invokes one or both of the guidelines stated in (1) and (2) above. The Program Director or his authorized representative will determine the appropriate response during launch operations.

3.3.4 Guidelines for Experiments and Systems/Operational Tests

This section sets forth guidelines to govern the planning and execution of experiments, systems tests, and operational tests.

3.3.4.1 Experiments Assignment

Experiment assignments for Mission SL-3 are given in Appendix A, Table A-1.

3.3.4.2 In-flight Systems/Operational Tests Assignment (TBD)

3.3.4.3 Pre-mission Planning Guidelines

The following guidelines, and those in the subsections below, shall be used in preparing the SL-3 mission plans:

- (1) Approximately one of every seven mission-days shall be scheduled as an off-duty day. Each off-duty day shall include performance of experiments M071 and M073, crew rest and recreation, nominal monitoring, crew planning, and ATM solar flare activity as required.
- (2) Scheduling of crew activities shall permit rapid crew response to solar flares that may occur when the ATM console is not manned.

3.3.4.3.1 Group-related Experiments

The group-related experiments comprise the ATM, EREP, and in-flight medical experiments. Those which are assigned to Mission SL-3 in Appendix A, Table A-1, shall be scheduled in accordance with the following guidelines:

- (1) The in-flight medical experiments shall be scheduled according to TBD guidelines.
- (2) Crew-attended ATM operations shall be scheduled for the equivalent of ten mission-hours per day, except on off-duty and EVA days.

- (3) Unattended ATM operations shall be scheduled in accordance with TBD guidelines.
- (4) The ATM experiments, excluding S055, shall each utilize a maximum of two magazines of film.
- (5) The EREP group of experiments shall be scheduled for at least 15 passes in the Z-local vertical attitude.

3.3.4.3.2 Individual Experiments

The individual experiments (see "Definitions" and Appendix A) shall be scheduled on Mission SL-3 in accordance with the following guidelines and the assignment instructions set forth in Appendix A:

- (1) The individual experiments assigned in whole or in part to Mission SL-3 shall be scheduled into those intervals of the crew timeline which have not been allotted for the group-related experiments, the necessary life-support activities (eat, sleep, off-duty, personal hygiene, systems housekeeping), and the educational activities TBD.
- (2) Those intervals of the timeline that remain unfilled after paragraph (1) has been satisfied shall be used for scheduling experiments whose assignment to Mission SL-3 is optional. This procedure shall be optimized with respect to experiment constraints, the flight scheduling precedence (given in Appendix A for each individual experiment), spacecraft stowage capacity, crew training requirements, and other mission parameters.

3.3.4.4 Real Time Planning Guidelines

The guidelines set forth in this section shall apply while the mission is in progress; detailed guidelines are TBS.

3.3.5 Unmanned Operations Guidelines

- (1) The following guidelines apply to the unmanned period of SWS operations between separation of the SL-2 CSM and docking of the SL-3 CSM.
 - (a) The SWS shall be controlled and interrogated from the ground during the unmanned period.
 - (b) The ATM experiments shall be operated an average of eight hours per day.
 - (c) Film for ATM experiments S052 and S054 shall be loaded during the end-of-mission SL-2 EVA for exposure during the unmanned period of SL-3. This film will remain in the experiment canisters until the mid-mission SL-3 EVA. No film shall be provided beyond that specified in paragraph 3.3.4.3.1(4).

- (2) The unmanned period that follows separation of the SL-3 CSM from the SWS will be part of Mission SL-4. Guidelines which apply to this period will therefore be found in Section 4.3.5.

4.0 SKYLAB MISSION SL-4

4.0 SKYLAB MISSION SL-4

4.1 MISSION DESCRIPTION

Skylab Mission SL-4 will begin when the SL-3 CSM and crew separate from the SWS just prior to reentry. The unmanned portion of the mission will continue until the SL-4 CSM and crew are launched to rendezvous and dock with the SWS. After docking, the SL-4 crew will enter the SWS, reactivate its systems, and proceed to inhabit and operate the orbital assembly for up to 56 days. During this time the crew will perform systems and operational tests and the assigned experiments. To conclude the mission, the crew will configure the SWS for indefinite unmanned operations, undock the CSM, and return to earth in the Command Module.

4.2 MISSION OBJECTIVES

- (1) Perform unmanned Saturn Workshop operations.
 - (a) Obtain data for evaluating the performance of the unmanned SWS.
 - (b) Obtain solar astronomy data by unmanned ATM observations.
- (2) Reactivate the Skylab orbital assembly in earth orbit.
 - (a) Operate the orbital assembly (SWS plus CSM) as a habitable space structure for up to 56 days after the SL-4 launch.
 - (b) Obtain data for evaluating the performance of the orbital assembly.
 - (c) Obtain data for evaluating crew mobility and work capability in both intravehicular and extravehicular activity.
- (3) Obtain medical data on the crew for use in extending the duration of manned space flights.
 - (a) Obtain medical data for determining the effects on the crew which result from a space flight of up to 56 days duration.
 - (b) Obtain medical data for determining if a subsequent manned space flight of greater than 56 days duration is feasible and advisable.
- (4) Perform in-flight experiments
 - (a) Obtain ATM solar astronomy data for continuing and extending solar studies beyond the limits of earth-based observations.

- (b) Obtain earth resources data for continuing and extending multisensor observation of the earth from the low earth orbit.
- (c) Perform the assigned scientific, engineering, technology and DOD experiments.

NOTE FOR DEVELOPMENT EMPHASIS

For hardware development, the above objectives, together with the amplifying remarks, are to be treated as criticality category 2; individual ATM, Earth Resources, and Medical Experiments shall be considered category 3. Scientific, Engineering, Technology and DOD experiments shall be category 3 or 4, as specified by the development centers. Individual critical elements within an experiment may be category 1 or 2 as appropriate. (See reference 7).

4.3 MISSION GUIDELINES

The guidelines called out in this section pertain specifically to the SL-4 mission.

4.3.1 Mission Development Guidelines

- (1) The SL-4 space vehicle shall be launched approximately 180 days after the launch of SL-2.
- (2) The SL-4 mission shall be planned for a duration of 56 days, measured from the launch of the SL-4 space vehicle.

4.3.2 In-flight Operations Guidelines

- (1) The Orbital Workshop shall be reactivated and the Waste Management System made available for crew use within 24 hours of the SL-4 launch.
- (2) Samples of all urine voided after SL-4 lift-off shall be processed in the Waste Management System as soon as it becomes available for use.

4.3.3 Launch Commit Guidelines

The Launch Mission Rules shall follow these guidelines in providing pre-determined commit/non-commit decisions on as many potential failures as possible:

- (1) The terminal launch countdown shall be scrubbed or held to repair any malfunction that can limit the SL-4 mission to less than 56 days duration.

- (2) The terminal launch countdown shall be scrubbed or held to repair any malfunction resulting in a single failure point, an in-flight failure of which could:
 - (a) Compromise crew safety, or
 - (b) Require early termination of the mission.
- (3) The terminal launch countdown shall not be automatically held or scrubbed to repair the loss of an individual experiment, unless the malfunction invokes one or both of the guidelines stated in (1) and (2) above. The Program Director or his authorized representative will determine the appropriate response during launch operations.

4.3.4 Guidelines for Experiments and Systems/Operational Tests

This section sets forth guidelines to govern the planning and execution of experiments, systems tests, and operational tests.

4.3.4.1 Experiments Assignment

Experiment assignments for Mission SL-4 are identified in Appendix A, Table A-1.

4.3.4.2 In-flight Systems/Operational Tests Assignment (TBD)

4.3.4.3 Pre-mission Planning Guidelines

The following guidelines, and those in the subsections below, shall be used in preparing the SL-4 mission plans:

- (1) Approximately one of every seven mission-days shall be scheduled as an off-duty day. Each off-duty day shall include performance of experiments M071 and M073, crew rest and recreation, nominal monitoring, crew planning, and ATM solar flare activity as required.
- (2) Scheduling of crew activities shall permit rapid crew response to solar flares that may occur when the ATM console is not manned.

4.3.4.3.1 Group-related Experiments

The group-related experiments comprise the ATM, EREP, and in-flight medical experiments. Those which are assigned to Mission SL-4 in Appendix A, Table A-1, shall be scheduled in accordance with the following guidelines:

- (1) The in-flight medical experiments shall be scheduled according to TBD guidelines.
- (2) Crew-attended ATM operations shall be scheduled for the equivalent of ten mission-hours per day, except on off-duty and EVA days.
- (3) Unattended ATM operations shall be scheduled in accordance with TBD guidelines.

- (4) The ATM experiments, excluding S055, shall each utilize not more than one magazine of film.
- (5) The EREP group of experiments shall be scheduled for enough passes in the Z-local vertical attitude to meet the total program requirement of 45 passes.

4.3.4.3.2 Individual Experiments

The individual experiments (see "Definitions" and Appendix A) shall be scheduled on Mission SL-4 in accordance with the following guidelines and the assignment instructions set forth in Appendix A:

- (1) The individual experiments assigned in whole or in part to Mission SL-4 shall be scheduled into those intervals of the crew timeline which have not been allotted for the group-related experiments, the necessary life-support activities (eat, sleep, off-duty, personal hygiene, systems housekeeping), and the educational activities TBD.
- (2) Those intervals of the timeline that remain unfilled after paragraph (1) has been satisfied shall be used for scheduling those experiments whose requirements have not been completed on the previous missions.

4.3.4.4 Real Time Planning Guidelines (TBS)

The guidelines set forth in this section shall apply while the mission is in progress; detailed guidelines are TBS.

4.3.5 Unmanned Operations Guidelines

- (1) The following guidelines apply to the unmanned period of SWS operations between separation of the SL-3 CSM and docking of the SL-4 CSM.
 - (a) The SWS shall be controlled and interrogated from the ground during the unmanned period.
 - (b) The ATM experiments shall be operated an average of eight hours per day.
 - (c) Film for ATM experiments S052 and S054 shall be loaded during the end-of-mission SL-3 EVA for exposure during the unmanned period of SL-4. This film will remain in the experiment canisters until the last SL-4 EVA. No film shall be provided beyond that specified in paragraph 4.3.4.3.1(4).
- (2) Guidelines for SWS operations following separation of the SL-4 CSM are TBD.

REFERENCES

1. Apollo Applications FY 1970 Project Approval Document; revision date June 29, 1970.
2. M-D ML 3200.056, Apollo Applications Flight Mission Assignments Document; October 1969.
3. SE 140-001-1, Apollo Applications Program Specification; (latest revision).
4. M-D ML 3200.069, SLPD No. 7A, Establishment of Skylab Program Interface Panel Organizations; March 18, 1970.
5. NHB 8040.1, Apollo Applications Configuration Management Requirements, March 1969.
6. Apollo Applications Reliability and Quality Assurance Program Plan, May 1967.
7. M-D ML 3200.117, AAPD No. 10A, AAP Nonconformance Reporting and Corrective Action; December 9, 1969.
8. Skylab Program Level I Schedules; (latest revision).
9. M-D 3200.137, SLPD No. 7, Skylab Program CCB Controls and Reporting Requirements; January 19, 1971.

APPENDIX A

EXPERIMENTS ASSIGNMENT

APPENDIX A

A1.0 EXPERIMENTS ASSIGNMENT

A1.1 GENERAL

This appendix identifies the experiments that have been approved by the Associate Administrator for Manned Space Flight for implementation on the Skylab Program. Herein the Program Director assigns experiments to specific missions, or, in lieu of stating specific assignments, establishes other instructions for planning and performing the experiments. General guidelines for the scheduling of experiments in the mission flight plans are given in Sections 2.3, 3.3, and 4.3, respectively. The formal objectives of each experiment are documented in the Skylab Program Specification (reference 3).

A1.2 EXPERIMENT ASSIGNMENTS TABLE

A1.2.1 Format

Table A-1 places each experiment in one of two groups: in-flight experiments and pre- and post-flight experiments. The in-flight experiments are divided further into three subgroups:

- (1) Passive Experiments -- experiments whose in-flight crew support requirements are either insignificant or non-existent.
- (2) Group-related Experiments -- experiments that require significant in-flight crew support and which are closely related to each other either through common study of the flight crew or by integration into a single subsystem. Three sets of group-related experiments are assigned in Table A-1: Medical, Solar Astronomy (ATM), and Earth Resources (EREP).
- (3) Individual Experiments -- the remaining experiments that require significant in-flight crew support and which are not as closely related to each other as are the experiments addressed in (2).

A1.2.2 Flight Scheduling Precedence (FSP)

The flight scheduling precedence is a number assigned to each of the individual experiments as a measure of that experiment's relative value to the program objectives. It has only a minor role in pre-mission planning, as Sections 2.3.4.3.2, 3.3.4.3.2, and 4.3.4.3.2 indicate. In real time mission planning, however, it may have a substantially more important function. Guidelines for the use of the Flight scheduling precedence in real time planning will be developed in Sections 2.3.4.4, 3.3.4.4, and 4.3.4.4, respectively.

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	ASSIGNMENT INSTRUCTIONS	TSP
PRE- AND POST-FLIGHT	M078	- Bone Mineral Measurement (B)	These experiments are assigned to Missions SL-1/SL-2, SL-3, and SL-4.	N/A
	M111	- Cytogenic Studies of Blood		
	M112	- Man's Immunity -- In vitro aspects		
	M113	- Blood Volume and Red Cell Life Span		
	M114	- Red Blood Cell Metabolism		
PASSIVE	M115	- Special Hematologic Effects	This experiment is assigned to the SL-2 flight (the experiment hardware is mounted on the SL-2 launch vehicle).	N/A
	M415	- Thermal Control Coatings		
	S071	- Circadian Rhythm -- Pocket Mice		
	S072	- Circadian Rhythm -- Vinegar Gnat		
	S150	- Galactic X-ray Mapping (B)		
	T018	- Precision Optical Tracking	This experiment is assigned to Missions SL-1/SL-2, SL-3, and SL-4 (the experiment hardware is located on the SL-2, SL-3, and SL-4 launch vehicles).	

TABLE A-1. Skylab Experiment Assignments

EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	ASSIGNMENT INSTRUCTIONS	FSP
MEDICAL	M071 - Mineral Balance	M073 - Bioassay of Body Fluids M074 - Specimen Mass Measurement M092 - In-flight Lower Body Negative Pressure M093 - Vectorcardiogram M151 - Time and Motion Study M171 - Metabolic Activity M172 - Body Mass Measurement M131 - Human Vestibular Function M133 - Sleep Monitoring	These experiments are assigned to Missions SL-1/SL-2, SL-3, and SL-4. This experiment is assigned to Missions SL-1/SL-2 and SL-3. This experiment shall be performed in 15 sleep-sessions on Mission SL-1/SL-2, and in 21 sleep-sessions on Mission SL-3.	N/A
	M073 - Bioassay of Body Fluids			
	M074 - Specimen Mass Measurement			
	M092 - In-flight Lower Body Negative Pressure			
	M093 - Vectorcardiogram			
	M151 - Time and Motion Study			
	M171 - Metabolic Activity			
	M172 - Body Mass Measurement			
	M131 - Human Vestibular Function			
	M133 - Sleep Monitoring			

Table A-1 (Continued)

EXPERIMENT GROUP	NUMBER	EXPERIMENT TITLE	ASSIGNMENT INSTRUCTIONS	FSP
ATM	S052	White Light Coronagraph	These experiments are assigned to Missions SL-1/SL-2, SL-3, and SL-4.	N/A
	S054	X-ray Spectrographic Telescope		
	S055	UV Spectrometer (A)		
	S056	Dual X-ray Telescope		
	S082	UV Spectrograph/Heliograph		
EREP	S190	Multispectral Photographic Facility	These experiments are assigned to Missions SL-1/SL-2, SL-3, and SL-4.	N/A
	S191	Infrared Spectrometer		
	S192	Multispectral Scanner		
	S193	Microwave Radiometer/Scatterometer and Altimeter		
	S194	L-Band Radiometer		

Table A-1 (Continued)

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	ASSIGNMENT INSTRUCTIONS	FSP
INDIVIDUAL	D008 -	Radiation in Spacecraft	Four active dosimeter surveys shall be performed on Mission SL-1/SL-2 (the experiment is integrated in CSM 116).	240
	D021 -	Expandable Airlock Technology(3)	One sample panel shall be retrieved on Mission SL-1/SL-2; the remaining sample panel shall be retrieved on either SL-3 or SL-4.	110
	D024 -	Thermal Control Coatings	One sample panel shall be retrieved on Mission SL-1/SL-2; the remaining sample panel shall be retrieved on either SL-3 or SL-4.	260
	M479 -	Zero-gravity Flammability (B)	A total of five sets of test cycles shall be performed, individually or collectively, on one, two, or three missions.	280
	M487 -	Habitability/Crew Quarters	This experiment shall be performed on Missions SL-1/SL-2, SL-3, and SL-4.	450
	M509 -	Astronaut Maneuvering Equipment	Each of three crewmen shall perform a set of four experiment runs (three unsuited and one suited). One set of runs shall be performed by one crewman on Mission SL-1/SL-2. The remaining two sets of runs shall be performed by two crewmen on SL-3, or by one crewman on SL-3 and one crewman on SL-4.	300

Table A-1 (Continued)

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	ASSIGNMENT INSTRUCTIONS	FSP
INDIVIDUAL	M512 -	Materials Processing in Space	<p>The metals-processing tasks requiring battery power shall be performed on Mission SL-1/SL-2.</p> <p>The remaining metals-processing tasks and the crystal growth task may be performed individually or collectively on either SL-1/SL-2 or SL-3.</p>	390
	S009 -	Nuclear Emulsion	One nuclear emulsion detector package shall be exposed and retrieved on Mission SL-1/SL-2.	220
	S015 -	Zero Gravity Single Human Cells	This experiment is assigned to Mission SL-1/SL-2 (the experiment hardware is integrated in CSM 116).	230
	S019 -	UV Stellar Astronomy	One hundred fifty data exposures on 36 starfields shall be obtained on Mission SL-1/SL-2. Another 150 data exposures on 36 starfields shall be obtained on either SL-3 or SL-4.	290
	S020 -	X-ray/UV Solar Photography	Ten data exposures on the quiet sun shall be obtained on each of two missions; ten data exposures on the active sun shall be obtained on each of the same two missions. The experiment shall be performed on any two of the three missions.	130

Table A-1 (Continued)

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	ASSIGNMENT INSTRUCTIONS	FSP
INDIVIDUAL	S063 -	UV Airglow Horizon Photography	A total of 600 data exposures shall be obtained on any one mission, or on any two missions, or on three missions.	120
	S073 -	Gegenschein/Zodiacal Light	Thirty-six photometer data scans shall be performed on each of Missions SL-1/SL-2, SL-3 and SL-4.	270
	S149 -	Particle Collection	Four sets of detector cassettes shall be deployed, exposed, and retrieved. One set shall be exposed during the unmanned portion of Mission SL-3, and one set shall be exposed on the manned portion of SL-3. A third set shall be exposed on the unmanned portion of SL-4. The fourth set may be exposed on either Mission SL-2 or the manned portion of SL-4.	140
	S183 -	UV Panorama	Thirty-five data exposures shall be obtained on Mission SL-1/SL-2; another 35 data exposures shall be obtained on either SL-3 or SL-4.	250
	T002 -	Manual Navigation Sightings (B)	This experiment shall be performed by one or more crewmen on one, two, or three missions, at the convenience of the crew and on a non-interference basis with the other experiments.	100

EXPERIMENT GROUP	EXPERIMENT NUMBER	EXPERIMENT TITLE	ASSIGNMENT INSTRUCTIONS	FSP
INDIVIDUAL	T003	In-flight Aerosol Analysis	This experiment shall be performed on Missions SL-1/SL-2, SL-3 and SL-4.	400
	T013	Crew Vehicle Disturbance	This experiment shall be performed in the OWS on any single mission.	210
	T020	Foot-controlled Maneuver Unit	Each of two crewmen shall perform a set of five experiment runs (three unsuited and two suited). The experiment shall be performed by two crewmen on any one mission, or by one crewman on one mission and by another crewman on a subsequent mission. At least one of the crewmen who perform T020 shall also perform one set of experiment runs on M509.	200
	T025	Coronagraph Contamination Measurement	A total of 150 data frames shall be exposed on Mission SL-1/SL-2.	130
	T027	ATM Contamination Measurement	One sample array shall be deployed, exposed and retrieved on Mission SL-1/SL-2.	380
			The program of photometer data scans shall be performed on each of Missions SL-1/SL-2, SL-3 and SL-4.	

Table A-1 (Continued)

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EXPERIMENT GROUP	EXPERIMENT NUMBER	TITLE	MISSION ASSIGNMENTS/SCHEDULING INSTRUCTIONS	FSP
COROLLARY	S009 - Nuclear Emulsion		One nuclear emulsion detector package shall be exposed and retrieved on Mission SL-1/SL-2.	220
	S015 - Zero Gravity Single Human Cells		This experiment is assigned to Mission SL-1/SL-2 (the experiment hardware is integrated in CM 116).	230
	S019 - UV Stellar Astronomy		"One hundred fifty data exposures, requiring the equivalent of 12 night passes averaging 32 minutes each, shall be obtained on the SL-1/SL-2 mission. Another 150 data exposures requiring the equivalent of 12 night passes averaging 32 minutes each, shall be obtained on either the SL-3 or SL-4 mission.	320
	S020 - UV/X-Ray Solar Photography		Ten data exposures on the quiet sun shall be obtained on each of two missions; ten data exposures on the active sun shall be obtained on each of the same two missions. The experiment shall be performed on Mission SL-3 and on one of the other two missions.	250
	S063 - UV Airglow Horizon Photography		A total of 600 data exposures shall be obtained on any one mission, or on any two missions, or on three missions.	120

TABLE A-2. Experiment Assignment and Scheduling Instructions

DISTRIBUTION

OMSF

M/Myers
MA/Petrone
MAO/Holcomb (2)
MB/Bass (2)
MM/Berry (10)
M-N/O'Donnell (2)
MSR/Cianella
MT/Culbertson (5)
MTX/Armstrong
ML/Schneider
MLD/Disher
ML-1/Ashley
MLA/Hanes (9)
MLO/Aller (50)
MLB/Field (5)
MLQ/Cohen (4)
MLE/Savage (4)

OSS

S/Naugle (20)

OA

E/Mathews (20)

OAST

R/Jackson (8)

OTDA

T/Truszynski (5)

ARC

DIR/Mark (5)

LaRC

DIR/Cortright (5)

LeRD

DIR/Lundin (3)

GSFC

110/Clark
800/Covington
810/Roberts
820/Wood
830/Varson
840/Stelter

KSC

AA/Hock (75)

MSC

KA/Kleinknecht (75)

MSFC

PM-SAT-MGR/Smith (10)
PM-SAT-MGR/Belew (75)

DOD

AFRDSD/Lt. Col. M. C. Spaulding
Stop 103

DOT

TIM/W/ Harriott